REMARKS

At the time the Office Action was mailed, claims 1 – 6 were pending. In this response claims 1-6 have been amended, and claims 7-22 have been added.

The Applicants would like to thank the Examiner for the courtesies extended to the Applicants' representative during the interview conducted on June 7, 2005.

Claim Objections

In Paragraph 1 of the Office Action, the Examiner objected to Claim 4. Applicants have amended Claim 4, and respectfully request that the Examiner withdraw the objection.

Rejection of Claims 1 – 6 Under 35 U.S.C. §112

In Paragraph 3 of the Office Action, the Examiner rejected claims 1 – 6 under 35 U.S.C. §112, first paragraph as failing to comply with the enablement requirement. To the extent the rejection applies to the amended claims, Applicants respectfully traverse the rejection.

It is asserted that the claims contain subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The Examiner states that there is no additional limitation in the pending claims to explain why the same structure that is specifically noted as not reducing/controlling drag and VIV can be used to successfully reduce/control drag and VIV. It is stated that either there is an enabling step or feature missing, or the claimed invention cannot work.

Applicants are submitting a declaration of Dr. Allen with the explanation as to the differences between the "Allen Paper" and the claimed invention: Independent claims 1-6 recite an element consisting of an ultra-smooth surface with a K/D roughness parameter of less than 1.0×10^{-4}. In contrast, at least 40% of the PVC pipe of the "Allen Paper" had a surface roughness of greater than 1.0×10^{-4}, as Dr. Allen explained in paragraphs 9-13 of his declaration.

Applicants respectfully request that the Examiner withdraw the rejection.

Rejection of Claims 1 – 6 for Double Patenting

Applicants are submitting herewith a corrected terminal disclaimer as requested by the Examiner.

Obviousness Rejections of Claims 1 – 6

Claims 1 and 4

In paragraph 6 of the Office Action, the Examiner rejected Claims 1 and 4 as being unpatentable over the "Allen Paper." To the extent the rejection applies to the amended claims, Applicants respectfully traverse the rejection.

Claim 1 recites: " ... a substantially cylindrical marine element consisting of an ultra-smooth surface about the cylindrical element having a K/D ratio of less than 1.0×10^{-4} ... "

Claim 4 recites: " ... a substantially cylindrical marine element consisting of an ultra-smooth effective surface with a K/D roughness parameter of less than 1.0×10^{-4} ... "

Applicants respectfully submit that the "Allen Paper" does not teach or suggest the desirability of an element consisting of an ultra-smooth surface with a K/D roughness parameter of less than 1.0×10^{-4}, as Dr. Allen explained in paragraphs 9-13 of his declaration.

Applicants respectfully request that the Examiner withdraw the rejection.

Claims 2-3 and 5-6

In paragraph 7 of the Office Action, the Examiner rejected Claims 2-3 and 5-6 as being unpatentable over the "Allen Paper" in view of Gregory (U.S. Paten 4,470,722)("Gregory"). To the extent the rejection applies to the amended claims, Applicants respectfully traverse the rejection.

Claim 2 recites: " ... an ultra-smooth surface coating about the cylindrical element consisting of a K/D ratio of less than 1.0×10^{-4} ... "

Claim 3 recites: " ... the sleeve consisting of a K/D ratio of less than 1.0×10^{-4} ... "

Claim 5 recites: " ... a substantially cylindrical marine element consisting of an ultra-smooth coating material with a K/D roughness parameter of less than 1.0×10^{-4} ... "

Claim 6 recites: " ... a substantially cylindrical marine element consisting of an ultra-smooth substantially cylindrical sleeve surrounding the marine element with a K/D roughness ratio of less than 1.0×10^{-4} ... "

As discussed above, Applicants respectfully submit that the "Allen Paper" does not teach or suggest the desirability of an element consisting of an ultra-smooth surface with a K/D roughness parameter of less than 1.0×10^{-4}, as Dr. Allen explained in paragraphs 9-13 of his declaration.

Applicants respectfully submit that Gregory does not remedy the deficiencies of the "Allen Paper" discussed above, as Gregory does not teach or suggest the desirability of an

element consisting of an ultra-smooth surface with a K/D roughness parameter of less than 1.0 X 10^{-4}.

Applicants respectfully request that the Examiner withdraw the rejection.

<u>Conclusion</u>

Attorney has responded to each and every ground for objection and rejection and respectfully submits that the claims, as amended, are patentable over the cited art. In the event the Examiner has any questions or comments regarding the above-presented materials, the Examiner is invited to call the undersigned at the telephone number below prior to the issuance of any formal action.

Respectfully submitted,

Donald W. Allen et al.

By [signature]

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PATENT
TH-1258 (US)
WEH:SWT

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450 on or before the date shown below.

William E. Hart

Date: 6/22/05

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	
Donald W. Allen et al	
Serial No. 09/625,893	Group Art Unit: 3673
Filed: July 26, 2000	Examiner: K. Mitchell
SMOOTH SLEEVES FOR DRAG AND VIV REDUCTION OF CYLINDRICAL STRUCTURES	June 17, 2005

Commissioner for Patents
P.O. Box 1450
Arlington, Virginia 22313-1450

Dear Sir:

TERMINAL DISCLAIMER (OVER PRIOR PATENTS)

Shell Oil Company is assignee of the entire interest in U.S. application Ser. No. 09/912,939, filed 25 July 2001, now U.S. 6,571,878, issued 3 June 2003, by assignment recorded 13 November 2002 at Reel/Frame 13476/0321.

Shell Oil Company is also assignee of the entire interest in U.S. application Ser. No. 09/845,678, filed 29 April 2001, now U.S. 6,702,026, issued 9 March 2004, which is a continuation-in-part of the present application 09/625,893, filed, 26 July 2000, by means of an assignment of the in the present application, recorded December 9, 2003 at Reel/Frame 014182/0244. U.S. 6,702,026 is subject to a terminal disclaimer in favor of U.S. 6,571,878.

Shell Oil Company hereby disclaims the terminal part of any patent granted on application Serial No. 09/625,893, which would extend beyond the expiration date of the full

statutory term of U.S. 6,571,878 or the statutory term of U.S. 6,702,026, as presently shortened by any terminal disclaimer in favor of U.S. Patent No. 6,571,878.

Shell Oil Company hereby agrees that any patent granted on application Serial No. 09/625,893 shall be enforceable only for and during such period that the legal title to said patent shall be the same as the legal title to U.S. 6,571,878 and U.S. 6,702,026, as presently shortened by any terminal in favor of U.S. 6,571,878, this agreement to run with any patent granted on U.S. application Serial No. 09/625,893, and to be binding upon the grantee, its successors or assigns.

Shell Oil Company does not disclaim any terminal part of any patent granted on application Serial No. 09/625,893 prior to the expiration date of the full statutory term as presently shortened by any terminal disclaimer of U.S. Patent No. 6,571,878 and 6,702,026 in the event that U.S. 6,571,878 and U.S. 6,702,026 later: expire for failure to pay a maintenance fee, are held unenforceable, are found invalid, are statutorily disclaimed in whole or terminally disclaimed under 37 C.F.R. 1.321(a), has all claims canceled by a reexamination certificate, or is otherwise terminated prior to the expiration of its statutory term as presently shortened by any terminal disclaimer, except for the separation of legal title stated above.

Please charge any applicable fees for filing this disclaimer to Shell Oil Company, Deposit Account 19-1800.

Respectfully submitted,

William E. Hickman
Reg. No. 46,771
Attorney of Record

PATENT
TH-1258 (US)
ERM:SWT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of Donald W. Allen et al Serial No. 09/625,893 Filed: July 26, 2000 SMOOTH SLEEVES FOR DRAG AND VIV REDUCTION OF CYLINDRICAL STRUCTURES	Group Art Unit: 3673 Examiner: K. Mitchell June 14, 2005

DECLARATION OF DR. DONALD W. ALLEN

I, Dr. Donald Wayne Allen declare as follows:

1. My name is Dr. Donald Wayne Allen. I am presently the Business Team Manager of the Pipelines Business Group for Shell Global Solutions (U.S.) and named inventor on the above-referenced patent application. I am more than 18 years of age, have not been convicted of a felony or a crime of moral turpitude, am of sound mind, and am competent to make this Declaration.

2. I received a B. S. in Mechanical Engineering from Texas A&M University in 1981, and a Ph. D. in Mechanical Engineering from Rice University in 1986. I have been a Staff Research Engineer – Offshore Structures for Shell since August 1986. I consult with various Shell and non-Shell entities regard the potential vortex-induced vibration ("VIV") problems with various subsea structures. In this role, I have performed VIV analyses of offshore and subsea structures such as production platforms, risers, riser bases, jumpers, tendons, spars, and pipeline spans.

3. I have performed research directed to the characterization of VIV conditions. I have also performed research directed to the development of VIV suppression devices, including various helical strake systems, fairing systems and shroud or covering systems. This research includes work performed at various Shell facilities located in Houston, Texas and at the Naval Surface Warfare Center, located in Caderock, Maryland.

4. I have authored and published a number of papers on the subject of VIV and its suppression, including a paper I co-authored with Dean Henning, entitled *Vortex-Induced Vibration Tests of a Flexible Smooth Cylinder at Supercritical Reynolds Numbers*, May 1997, (the "Allen Paper").

5. I have authored a number of patent applications and patents on the subject of VIV and its suppression including United States Patent Numbers 5,410,979; 5,421,413;

5,875,728; 6,092,483; 6,179,524; 6,196,768; 6,223,672; 6,227,137; 6,263,824; 6,309,141; 6,551,029; 6,561,734; 6,571,878; 6,644,894; 6,685,394; and 6,702,026.

6. I have reviewed the Office Action that was issued in the above-referenced application, in which the Examiner rejected claims 1-6 over my paper by itself, or over my paper in view of another reference.

7. With reference to the Allen Paper, the cylinders used in the paper were 78.5" in length. There was a single ABS cylinder used, which had an outside diameter of 3.5 in. There was a single PVC cylinder used which had an outside diameter of 5.5625 in. P. 681, col. 1, Test Setup. As may be readily determined, this resulted in cylinder surface areas of approximately 863.2 in^2 and 1371.8 in^2, respectively. The data presented in the Allen Paper details the PVC pipe as having an average k/D surface roughness of 9.94E-4, with samples in the ranging from 8.86E-5 to 1.09E-4 and the ABS cylinder having an average cylinder roughness k/D of 1.37E-4, with the samples ranging from 1.21E-4 to 1.51E-4. While the Allen Paper discusses cylinders having the above ranges, it is now clear to me that one could misconstrue the paper as indicating that there existed multiple pipes of each type. The tests were carried out with a single pipe of each type, with the surface roughness information being obtained from various samples from that single test pipe. While the following discussion focuses on the testing of the PVC cylinder, identical test methods were used to determine the roughness for the ABS pipe.

8. The methodology used to determine the surface roughness is as follows: Five 1 inch by 1 inch samples were cut from each pipe following the flow tests. The sites for the samples were arbitrarily selected. The approximately 1 in^2, was selected to permit a sample to be mounted on a microscope slide. The microscope then sampled 2mm x 2mm (0.0062 in^2) out of the 1 square inch. The total area sampled (0.031 in^2 5 multiplied by 0.0062 in^2) for the surface roughness test represents 0.00226 percent of the total surface area of the PVC pipe. The confocal scan of each sample using a laser microscope was performed at Shell's facilities at the Westhollow Technology Center.

9. The results of the 1995 tests for the PVC pipe are summarized below in Table 1.

Sample	R_a (μm)	R_a (in.)	R_q (μm)	R_q (in.)	k/D
1	14.42	5.58E-04	18.41	7.25E-04	1.02E-04
2	13.91	5.48E-04	17.97	7.07E-04	9.85E-05
3	12.52	4.93E-04	15.97	6.29E-04	8.86E-05
4	15.42	6.07E-04	19.57	7.70E-04	1.09E-04
5	13.94	5.49E-04	17.88	7.04E-04	9.87E-05
Mean	14.04	5.53E-04	17.96	7.07E-04	9.94E-05

Table 1

In Table 1, R_a is the integrated average peak to trough roughness, and R_q represents the scatter of roughness about the mean roughness. An Appendix is attached to this declaration setting forth the formulas for determining these parameters. As may be seen from Table 1, and the explanation within the Appendix, smoothness can vary significantly from sample to sample, as well as within a sample.

10. It is this variation, both within a sample and as from sample to sample, together with the relatively small sampling area, that leads me to believe based on a statistical analysis that at least 40% of the PVC pipe had a surface roughness of greater than 1.0E-4. By a

similar analysis, at least 95% of the ABS pipe had a surface roughness of greater than 1.0E-4.

11. Amended claims 1-6 recite a cylindrical element consisting of a surface having a K/D ratio of less than 1.0E-4 to reduce vortex induced vibration. Since at least 40% of the PVC pipe and 95% of the ABS pipe had a surface roughness of greater than 1.0E-4, those pipes were too rough to be effective in reducing vortex induced vibration. In contrast, in the examples in this application, I tested a smooth fiberglass cylinder having a K/D of 5.1E-5, which did provide suppression of VIV and drag, and was within the claim recitation of consisting of a surface having a K/D ratio of less than 1.0E-4.

12. I can explain the difference in response of the PVC and ABS cylinders in the Allen paper, and the smooth fiberglass cylinder of this application, as the PVC and ABS cylinders being too rough, not consisting of a surface having a K/D ratio of less than 1.0E-4, while the fiberglass cylinder was significantly smoother and did consist of a surface having a K/D ratio of less than 1.0E-4.

13. A single rough point, or a small number or percentage of rough areas on a cylinder having a K/D ratio of greater than 1.0E-4 would not interfere with the VIV and drag suppression. However, since the PVC pipe had a significant percentage of at least 40% of the surface area of the pipe having a K/D ratio of greater than 1.0E-4, VIV and drag suppression was adversely affected.

I am aware that willful false statements and the like are punishable by fine or imprisonment, or both under Title 18 U.S.C. §1001 and may jeopardize the validity of the application or any patent issuing hereon. All statements made herein are made based on my own knowledge are true and that all statements made on information and belief are believed to be true.

Donald W. Allen, Ph.D.

Date: D Allen

Sharon S. Mellor

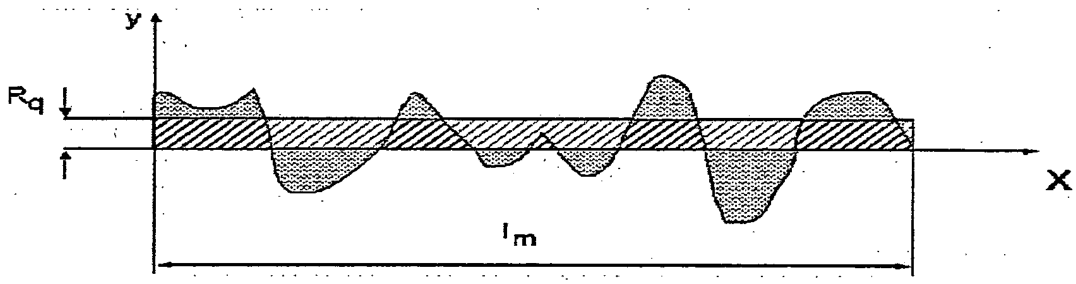
APPENDIX

Definitions of R_a, R_q

Surface, Rq value

This number represents the scatter of the amplitude values around the zero line.
This value is calculated using the following formula:

$$R_q = \sqrt{\frac{1}{I_m}\int_0^{I_m} y^2(x)dx}$$

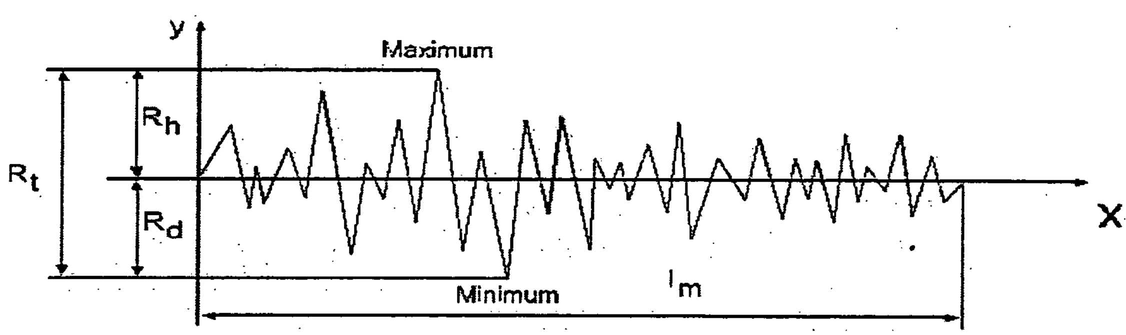


Surface, Rt, Rh, Rd values

These numbers represent the difference between maximum and minimum of a profile (span).

The values are calculated using the following formulae:

$$R_h = Maximum(y_i)$$
$$R_d = Minimum(y_i)$$
$$R_t = R_h - R_d$$



Surface, Ra value

This number represents the average peak-to-trough height of a measuring surface.
The average peak-to-trough height corresponds to the height of a rectangle the length of which is equal to the total measuring distance *lm*
The surface area of the rectangle must be equal to the sum of the area enclosed between roughness profile and centerline.
The average peak-to-trough height is calculated using the following formula:

$$R_a = \frac{1}{I_m} \int_{x=0}^{x=I_m} |y| dx$$